



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**

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NMFS Tracking  
No. 2003/00231

September 26, 2003

Daniel Mathis, P.E.  
Division Administrator  
Federal Highways Administration  
Suite 501 Evergreen Plaza  
711 South Capital Way  
Olympia, Washington, 98501-1284

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the SR 20, MP 90.1 Vicinity, Debris Flow Structure Project (WRIAs 3 and 4).

Dear Mr. Mathis:

The attached document contains the NOAA's National Marine Fisheries Services's (NOAA Fisheries) Biological Opinion (Opinion) on the Federal Highways Administrations' (FHWA) proposed SR 20, MP 90.1 Vicinity, Debris Flow Structure Project in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 USC 1531 *et seq.*). This document includes the consultation on Essential Fish Habitat (EFH) pursuant to Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations (50 CFR Part 600).

The FHWA had determined, under the ESA, that the proposed action, as detailed within the Biological Assessment (BA) and associated documents, is likely to adversely affect the Puget Sound chinook salmon (*Oncorhynchus tsawytscha*), which is ESA-threatened.

The Opinion and the EFH consultation are based on information provided by the FHWA in the BA received by NOAA Fisheries, and additional information transmitted via telephone conversations, meetings, mail and e-mail with the FHWA and the Washington State Department of Transportation. A complete Administrative record of this consultation is on file at the Washington Habitat Branch Office.



NOAA Fisheries has concluded that implementation of the proposed action is not likely to jeopardize the continued existence of Puget Sound chinook salmon. As required by Section 7 of the ESA, NOAA Fisheries has included reasonable and prudent measures with nondiscretionary terms and conditions that NOAA Fisheries believes are necessary to minimize the potential for incidental take associated with this action. NOAA Fisheries determined that EFH may be adversely affected, and has included conservation recommendations that will sufficiently address adverse effects to EFH.

Thank you for your efforts to protect threatened Puget Sound chinook. If you have any questions, please contact Michael Grady of the Washington State Habitat Branch Office at (206) 526-4645, or [Michael.Grady@noaa.gov](mailto:Michael.Grady@noaa.gov).

Sincerely,

*for Michael R Crouse*

D. Robert Lohn  
Regional Administrator

cc: Gary Davis, WSDOT  
Ken Berg, FWS

**ENDANGERED SPECIES ACT - SECTION 7**

**BIOLOGICAL OPINION**

**AND**


**MAGNUSON-STEVENS FISHERY CONSERVATION AND  
MANAGEMENT ACT ESSENTIAL FISH HABITAT  
CONSULTATION**

**SR 20, MP 90.1 Vicinity, Debris Flow Structure**

**NMFS Tracking No.: 2003/00231**

Agency: Federal Highway Administration

Consultation Conducted By: National Marine Fisheries Service  
Northwest Region

Approved by:  Date: September 26, 2003  
D. Robert Lohn  
Regional Administration

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## 1.0 INTRODUCTION

The Endangered Species Act (ESA) (16 U.S.C. 1531-1544), amended in 1988, establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants and the habitat on which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with the United States Fish and Wildlife Service and the NOAA's National Marine Fisheries Service (NOAA Fisheries), as appropriate, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or to adversely modify or destroy their designated critical habitats. This document is the product of an interagency consultation pursuant to section 7(a)(2) of the ESA and implementing regulations found at 50 CFR Part 402, and the Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996<sup>1</sup> (Public Law 104-267).

This document transmits NOAA Fisheries' Biological Opinion (Opinion) and MSA consultation based on our review of a project to construct a Debris Flow Structure (DFS) under State Route (SR) 20 in Skagit County, Washington. This structure is adjacent to the Skagit River, in the range of the Puget Sound (PS) chinook salmon Evolutionary Significant Unit (ESU).

The objective of the ESA portion of this consultation is to determine whether the proposed action by Federal Highway Administration (FHWA) is likely to jeopardize the continued existence of PS chinook (*Oncorhynchus tshawytscha*). The Biological Assessment (BA) provided by FHWA/Washington State Department of Transportation (WSDOT) with requests for consultation, described below, included the finding that the action is "likely to adversely affect" the PS chinook ESU listed as threatened under the ESA. Objectives of the MSA portion of this document, under section 305(b)(4) of the Act, is to provide discretionary Essential Fish Habitat (EFH) conservation and enhancement recommendations to the FHWA for actions that may adversely affect EFH.

### 1.1 Background Information and Consultation History

On December 20, 1999, NOAA Fisheries staff received a phone call from WSDOT personnel regarding a recent slide that blocked transportation on SR 20. The WSDOT proposed clearing the debris, 4,000 cubic yards in total, to allow vehicle access and assess any other potential damage to the highway. NOAA Fisheries advised WSDOT on methods to reduce effects on listed species, and subsequently followed the telephone conversation with a letter which further detailed preferred management and procedural suggestions.

While the initial clearing of debris was sufficient to allow vehicle use, WSDOT determined that

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<sup>1</sup>Public Law 104-267, the Sustainable Fisheries Act of 1996, amended the Magnuson-Stevens Fishery Conservation and Management Act to establish new requirements for EFH descriptions in Federal fishery management plans (FMPs) and to require that Federal agencies consult with NOAA Fisheries on activities that may adversely affect EFH. State agencies and private parties are not required to consult with NOAA Fisheries unless that action requires a Federal permit or receive Federal funding.

an additional large volume of material was likely to deposit on SR 20 within the foreseeable future, representing a significant safety risk to users of the highway. As such, WSDOT proposed constructing a DFS under SR 20 to facilitate the transfer of materials directly to the Skagit River, and bypassing the highway.

On May 9, 2000, NOAA Fisheries received a BA and request for section 7 consultation from the FHWA for the construction of the DFS. Within the proposed action, WSDOT committed to spending up to 200,000 dollars (referred to as the habitat fund) to preserve and enhance habitat within the Skagit River in order to address adverse indirect effects anticipated to be associated with the DFS. As part of the proposed action, WSDOT intended to commence construction of the DFS during the low flow period of the Skagit River, typically August on an annual basis. At the time the action was initially proposed, the habitat fund elements of the action did not have any specific biological purpose or measures other than to enable acquisition of land that might be protected in perpetuity with some unspecified functional benefit to PS chinook. As such, the action contained nothing for NOAA Fisheries to analyze relative to the effects of the other elements of the action that were likely to adversely affect PS chinook. As proposed, WSDOT's project consisted of DFS construction and an acquisition fund intended to enable the best possible minimization of the effects of building and operating the DFS on PS chinook and their habitat.

The importance of the construction of the DFS to avoid future risks to life and property damage led the action agency and WSDOT to characterize the proposed action as an emergency. During the summer of 2000, NOAA Fisheries agreed to consult on the proposed action on an after the fact basis, as this would also enable WSDOT to define the use of the habitat fund. Defining the use of the habitat fund also provided NOAA Fisheries sufficient information to analyze the total effects of the project, make a determination regarding jeopardy, prepare an Opinion and develop reasonable and prudent measures to minimize incidental take. Using certain construction techniques developed during consultation, direct effects from DFS construction were determined unlikely to cause take of listed PS chinook. The FHWA/WSDOT then proceeded to define the use of the habitat fund to address the long-term indirect effects of the DFS, and NOAA Fisheries consummated preparation of the Opinion.

On August 22, 2002, NOAA Fisheries received a letter from WSDOT detailing the proposed use of the habitat fund to purchase property and conservation easements within the Skagit River watershed. Final information needed to complete the consultation was received from WSDOT on November 20, 2002.

The FHWA has determined that threatened PS chinook salmon (*Oncorhynchus tshawytscha*) occur within the project area. The FHWA determined that the proposed actions were likely to adversely affect the indicated species. The effects determination was made using the methods described in Making ESA Determinations of Effect for Individual or Grouped Actions at the Watershed Scale (NMFS 1996).

## **1.2 Description of Proposed Action**

To minimize the effects of maintaining the DFS, FHWA/WSDOT proposes to utilize the habitat fund to purchase a parcel (the “Smith property”) and encumber the property with a conservation easement in concert with a similar Nature Conservancy effort known as the “White Creek property.” The Smith Property is located near river mile (RM) 66 on the Skagit River.

Approximately 42 acres in size, it is located on a forested island, surrounded by the Skagit River, Sauk River and Mcleod’s Slough. The White Creek property is located in the Sauk River, which drains to the Skagit River at RM 66. The FHWA/WSDOT have intended for these properties to be preserved to address habitat impacts from the operation of the DFS near the town of Concrete in Skagit County, Washington. Each property will be held in perpetuity to preserve habitat conditions.

As built, the DFS consists of a bulb-T bridge at mile post (MP) 90.1 at RM 57. The DFS is designed to pass a landslide event from the adjacent slope, under SR 20, and into the Skagit River. In addition to large wood, cobble and gravel, the DFS will pass up to 200,000 cubic yards of sedimentary material into the Skagit River. A 12% grade was established beneath the bridge allowing the slope to “daylight” a few feet above the Skagit River. An existing culvert was removed in the dry and the surrounding fill totaling 3,100 cubic yards was permanently excavated to provide a 13-foot vertical clearance. The amount of riprap in the project area was reduced from 500 cubic meters to 310 cubic meters. All bare earth was landscaped and planted to further minimize erosion and begin to replace the function of the lost vegetation. In addition, most of the riprap was covered with organic material and planted with vegetation. The project did not include any in-water work, work beneath the ordinary high water mark, or result in a net gain of impervious surfaces. All appropriate conservation techniques were utilized during construction operations, which allowed work to proceed with no adverse effects on listed species.

## **1.3 Description of the Action Area**

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For this project, the action area is defined as extending from RM 7 of the Sauk River, down-river to the Skagit River at RM 66 and further downstream to the confluence of the Skagit and Puget Sound.

Accordingly, activities and potential affects occurring under the proposed action would occur within a relatively significant portion of the range of PS chinook salmon.

## 2.0 ENDANGERED SPECIES ACT

### 2.1 Biological Opinion

#### 2.1.1 Status of Species

Puget Sound chinook salmon were listed as threatened under the ESA on March 24, 1999 (64 FR 14308). The ESU includes all naturally spawned populations of PS chinook salmon from rivers and streams flowing into Puget Sound including the Straits of Juan De Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington.

The Puget Sound ESU is a complex of many individual populations of naturally spawning chinook salmon, and 36 hatchery populations (March 24, 1999, 64 FR 14308). Recently, NOAA Fisheries' Puget Sound Technical Recovery Team (TRT) tentatively identified 21 geographically distinct populations of chinook in Puget Sound, including six in the Skagit River Basin. The Skagit River is one of a few river systems in the Puget Sound ESU that supports both spring and fall runs and is possibly the only river system in the Puget Sound ESU that supports spring, summer, and fall runs. Chinook salmon are found throughout the entire Skagit mainstem and most of its larger tributaries (e.g., Cascade River, Sauk River). Notable exceptions include the Baker River, where two dams restrict volitional access and areas above three dams on the Upper Skagit.

Overall abundance of chinook salmon in this ESU has declined substantially from historical levels, and many populations are small enough that genetic and demographic risks are likely to be relatively high. Short-term and long-term trends in abundance are predominantly downward, and several populations are exhibiting short-term declines. Contributing to these reduced abundances are widespread stream blockages, degraded habitat, with upper tributaries widely affected by past poor forestry practices and lower tributaries and mainstem rivers affected by urbanization and agriculture. Hatchery production and releases of chinook salmon in Puget Sound is widespread and more than half of the recent total Puget Sound escapement returned to hatcheries. Spring and summer run populations throughout this ESU are all depressed and are of special concern to NOAA Fisheries (Myers *et al.* 1998).

According to peak recorded harvest landings in Puget Sound in 1908, the historic run size of the PS chinook ESU was estimated to be about 670,000 (Bledsoe *et al.* 1989). Recent mean escapements totaling 71,000 correspond to a run entering Puget Sound of 160,000 fish based on run reconstruction of escapement and commercial landings within Puget Sound. While mean escapement numbers still range in the tens of thousands, 11 of the then 29 populations (reflecting a Washington Department of Fish and Wildlife (WDFW) estimate at the time; distinct populations have since been redefined by the TRT) within the ESU were determined to be at "critical" risk with fewer than 1,000 fish. Widespread declines and extirpations of spring and summer run PS chinook populations represent a significant reduction in the life history diversity of this ESU.

### 2.1.2 Evaluating The Proposed Action

The objective of this Opinion is to determine whether the proposed action will jeopardize listed PS chinook. The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 CFR 402 (the consultation regulations). NOAA Fisheries must determine whether the action is likely to jeopardize the listed species and/or whether the action is likely to destroy or adversely modify critical habitat. This analysis involves the initial steps of: (1) defining the biological requirements of the listed species; and (2) evaluating the relevance of the environmental baseline to the species' current status.

Subsequently, NOAA Fisheries evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NOAA Fisheries must consider the estimated level of mortality attributable to: (1) collective effects of the proposed or continuing action; (2) the environmental baseline; and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed species' life stages that occur beyond the action area. If NOAA Fisheries finds that the action is likely to jeopardize, NOAA Fisheries must identify reasonable and prudent alternatives for the action.

For the proposed action, NOAA Fisheries' jeopardy analysis considers direct or indirect mortality of fish attributable to the action, and considers the extent to which the proposed action impairs the function of essential elements necessary for migration, spawning, and rearing of the listed species under the existing environmental baseline.

#### *2.1.2.1 Biological Requirements*

The first step in the methods NOAA Fisheries uses for applying the ESA section 7(a)(2) to listed salmon is to define the species' biological requirements that are most relevant to each consultation. NOAA Fisheries also considers the current status of the listed species taking into account population size, trends, distribution and genetic diversity. To assess the current status of the listed species, NOAA Fisheries starts with the determinations made in its decision to list PS chinook for ESA protection and also considers new data available that is relevant to the determination (see Table 1 for references).

The relevant biological requirements are those necessary for PS chinook to survive and recover to naturally reproducing population levels such that protection under the ESA would become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stock, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment.

Five general classes of features or characteristics determine the suitability of aquatic habitats for salmonids: flow regime, water quality, habitat structure, food (energy) source, and biotic interactions (Spence *et al.* 1996). For this consultation, NOAA Fisheries believes all of the above habitat parameters might be adversely affected for the short-term as a result of the those

elements of the proposed action that are likely to adversely affect PS chinook.

References for further background on listing status, biological information and critical habitat elements can be found in Table 1.

#### 2.1.2.2 *Status of the Species*

References to Federal Register Notices containing additional information concerning listing status and biological information for listed species considered in this Opinion are described in Table 1.

**Table 1.**

<b>Species (Biological Reference)</b>	<b>Listing Status Reference</b>
Chinook Salmon from Washington, Idaho, Oregon and California, (Meyers, <i>et al.</i> 1998).	The Puget Sound ESU is listed as Threatened under the ESA by the NOAA Fisheries, (March 1999, 64 FR 14308).

#### 2.1.2.3 *Environmental Baseline*

The environmental baseline represents the current set of basal conditions to which the effects of the proposed action are added. Environmental baseline is defined as “the past and present impacts of all Federal, state, and private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or informal section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation process” (50 CFR 402.02).

The proposed project is located in the Skagit River watershed in Skagit County, Washington. The watershed drains a land area of approximately 2,792 square miles in Washington State and British Columbia, Canada with headwaters in the Cascade Mountains within Washington and British Columbia. The DFS is located at RM 57, while the Smith property is located at RM 65, and the White Creek property RM 7.5 of the Sauk River. Collectively, these sites provide habitat for spawning and rearing for the six major populations of PS chinook in the Skagit River.

Similar to chinook habitat throughout the Puget Sound ESU, the Skagit River basin has been significantly altered by human activities for over a century. The upper watershed and associated tributaries have been impacted from historic logging practices, including steep slope and riparian harvest, resulting in increased sediment transport downstream (Williams *et al.* 1975; Beamer *et al.* 1999). Extensive logging has occurred throughout most major tributary basins, and urbanization and agricultural operations have resulted in the diking of large portions of the river below the town of Sedro-Woolley. Significant proportions of riparian areas are ripped and consist of maintained grass cover (Romanski 1997). Land conversions (i.e. from forested to rural/urban) throughout the basin have, and are anticipated to further degrade habitat functions through altering water quality and increasing water quantities delivered to salmonid bearing

waterways. Increased fine sediment levels delivered to surface waters is a common consequence of these type of land-use conversions.

Historically, extensive large wood jams were found throughout the basin (Williams *et al.* 1975). Riparian alteration through logging, urbanization, agriculture, and dike and road building has altered the natural rate of large wood and allochthonous recruitment through substantial portions of the Skagit River basin (Romanski 1997). In the past, large wood has been actively removed from the river, and continues to be removed at some in-water bridge abutments (Arn Thoreen, pers. comm.).

The lower Skagit River is dominated by agricultural land use with some urbanized centers such as the Cities of Mount Vernon and Burlington. Management of agricultural and urban lands has degraded salmonid habitat in many areas of the watershed. Practices such as farming to the edge of streams, removing riparian vegetation, filling off-channel areas, diking and channelization, conversion of native perennial vegetation to annual crops, irrigation, increasing stormwater flow into the river, pollutant and fine sediment loading, increased surface water temperature, and exacerbated flooding have all contributed to habitat degradation in the action area.

#### *2.1.2.4 Status of the Species within the Action Area*

In 2001, the TRT identified six independent populations of PS chinook within the Skagit River basin. It is anticipated that all six populations within the Skagit River may be influenced by the proposed action. Fish from all stocks utilize the area of the DFS for rearing, holding and migration, with one stock spawning nearby as well. In addition, certain stocks utilize the riverine areas near the conservation properties as well. Collectively, these stocks support the largest naturally reproducing chinook run in the Puget Sound. The Skagit River stocks represent one of the three largest PS chinook runs not heavily influenced by hatchery supplementation (Myers *et al.* 1998).

**Table 2. Puget Sound Chinook Skagit River Population Data**

<b>Skagit Population</b>	<b>Spawning Locations</b>	<b>Ocean/Stream Type Ratio</b>	<b>Population<sup>b</sup></b>
Lower Skagit River	Mainstem Skagit downstream of the Sauk River (RM 66). Tributaries include Hansen, Alder, Grady, Jackman, Jones, Nookachamps, Sorenson, Day and Finney Creeks.	(55/45) <sup>a</sup>	1,537

Upper Skagit River	Mainstem Skagit RM 66 to RM 94. Tributaries include Diobsud, Bacon, Falls, Goodell, Illabot, and Clark Creeks.	(55/45) <sup>a</sup>	7,332
Suiattle River	Mainstem and tributaries including Buck, Downey, Sulphur, Tenas, Lime, Circle, Straight, and Big Creeks.	(18/82) <sup>a</sup>	401
Lower Sauk River	Downstream of RM 21.	(55/45) <sup>a</sup>	480
Upper Sauk River	Upstream of RM 39.	(55/45) <sup>a</sup>	298
Cascade River	Approximately RM 6 to RM19.	N/A, thought to be predominately stream type. <sup>c</sup>	268

<sup>a</sup> Data compiled by Myers *et al.* (1998), ocean/stream type ratios may reflect single year sampling results.

<sup>b</sup> NOAA Fisheries Biological Review Team, Draft Report 2003. Naturally Spawning fish.

<sup>c</sup> Washington State Department of Fish and Wildlife (WDF) 1993.

Lower Skagit chinook spawn from September through late November. Recent redd surveys reveal that this stock constructs a mean of 250 redds between RM 20 and RM 66, with the majority of these located below the project site at RM 57 (WSDOT 2000). Eighty to 90% of this stock utilize the main-stem of the Skagit River for spawning, historically, the closest spawning site to the project would likely be located approximately one third of a mile downstream of the confluence of the Baker River, near RM 56. Chinook typically construct from 3 to 15 redds in this section of the river (WSDOT 2000). Downstream of this site, minimal spawning occurs for approximately two miles, where 45 redds are typically constructed from RM 54 to RM 52. Due to their utilization of the mainstem of the Skagit River downstream from the project site for spawning and rearing, this stock is most at risk from landslide events under the DFS. Chinook also spawn near the Smith Property in the main-stem Skagit and McCleod's Slough (K. Buchanon, WDFW, pers. comm.).

The rest of the populations would not be nearly as affected because their redds are upstream of upstream of the project site. Juveniles of these other populations rearing near/down-river from the project site may be affected by a landslide.

#### *2.1.2.5 Factors Affecting Species Environment in the Action Area*

The action area represents a relatively large portion of riverine habitat within the Skagit River Basin. Although baseline conditions in the Skagit River Basin vary, most of the Skagit River Basin is in forestry and agricultural land use. Most of the private land in the headwaters is managed for timber harvest. The lowlands are dominated by agriculture and urban areas.

Similar to the rest of the Puget Sound, land development in the action area is occurring at a relatively rapid rate. As such, effects on aquatic habitats are continuing to occur through the alteration of hydraulic regimes from impervious surface increase, among the most acute consequences of which typically includes increases of sediment delivery to streams. In addition, past forest management on state, private and Federal lands resulted in increased sediment delivery through chronic and catastrophic (i.e. landslides) mechanisms. Sediment delivery rates have been characterized as impaired<sup>2</sup> for roughly half of the fifth field subbasins in the Skagit River Basin, including the basin within the project area (Beamer *et al.* 1999). Collectively, increased sediment delivery rates can compromise chinook spawning habitats through factors discussed in section 2.1.3.2.

As previously detailed, streambank conditions and floodplain connectivity in the action area are degraded by bank armoring, levees, channelization, and other flood control measures. Agricultural practices, armored banks, and urban development have reduced riparian buffers. Buffer widths are narrow and vegetation is mostly immature. Bank armoring, including that along SR 20, has hindered large wood recruitment in the action area. State Route 20 roughly parallels the north side of the main-stem Skagit River from the City of Burlington to the town of Newhalem (RM 18 to RM 96), alternating from over two miles to the north to immediately adjacent to the river. The project is located near RM 57, less than half a mile upriver from the town of Concrete, which is located at the confluence of the Skagit and the Baker River. Habitat near the DFS is largely coniferous and deciduous forest, with some agricultural utilization, and increasing amounts of rural development. The slide area is located in a 20 acre subbasin that is forested with largely mature alder with lesser amounts fir and cedar. After the initial slide event on December 12/13 1999, the lower portion of the seasonal flow channel became deeply incised with slopes near 100%.

State Route 20 is located on an embankment approximately 40 feet in elevation above the Skagit River. Prior to the construction of the highway, the river channel historically abutted what is now the uphill slope, (northern side) of the highway, resulting in near vertical slopes that exceed 50 feet high (WSDOT 2000).

The glaciation of Skagit Valley resulted in the deposition of silt and clay on top of glacial outwash. Advance outwash deposits of compact sand and gravel are predominantly exposed in the steep slope immediately adjacent to the highway (WSDOT 2000). Glacial tills and their associated clay content generally are a impediment to ground water flow. In turn, ground water passes quickly through outwash materials and to the top of the till layer, which generally forces flow horizontally, eventually emerging out of bluffs as spring or seeps. Landslides are common under these conditions because the till layers function as slide surfaces. The period of greatest landslide activity in Puget Sound is late winter or early spring, when the ground is most saturated with water (Terich 1987). The WSDOT has determined that an additional slide of up to 200,000 cubic yards is likely to occur in the future, and the most likely time period is from November

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<sup>2</sup> Beamer *et al.* (1999) defined “impaired” as average annual sediment supply greater than 1.5 times the natural rate. Fifth field watershed above the uppermost dams in the Skagit were not analyzed.

through March of each year.

The 20 acre subbasin is owned by a timber company, with two up-slope 20 acre parcels owned by private land-owners. Some cedar trees in have been selectively harvested in the last two or three years via a helicopter, and the area appears to have been logged 25-40 years ago (B. Wallis WSDOT, pers. comm.). There is a recently constructed (1995-98 as estimated by WSDOT) private residence at the crest of the slope directly above the active landslide area. According to the BA, it is unclear whether stormwater from this residence has influenced the stability of the slide area, although future development near the subbasin may influence landslide rate and timing. The two, 20 acre parcels adjacent to the subbasin are zoned by Skagit County as forested, with one to two acre parcels separated for individual houses (B. Wallis WSDOT, pers. comm.).

Upstream from the DFS, the Smith property is a 42 acre tract located on an island as the Sauk River flows into the Skagit River (RM 66 to RM 67.3). It is surrounded by the mainstem Skagit, and McCleod Slough. Historically, the property was used as a commercial pasture and woodland production area. Much of the property is located within frequently flooded areas and past forest management and grazing of the site has increased riparian soil loss from decreased native vegetation. In the upland sites, native vegetation consist of mixed hardwoods including red alder, black cottonwood and bigleaf maple. Douglas fir is the dominant conifer, with an understory of shrubs that include salmonberry, vine maple, swordfern and others. Located at the confluence of the Sauk and the Skagit River, the islands' riparian and floodplain habitat likely serves as important refuge for juvenile PS chinook migrating and rearing from the Sauk, and the upper Skagit River areas. The Smith Property has approximately 1,350 feet of Skagit River riparian frontage.

White Creek flows into the Sauk River near RM 7.5. The White Creek property is located close to the confluence of White Creek and the Sauk. The site, which is from 80-100 acres in size, is located on both sides of the creek, and its vegetation consist of douglas fir, hemlock and red alder. The understory consists of huckleberry, salmonberry and salal. Near the property, the creek itself has relatively large amounts of large wood, logjams and the corresponding pools associated with these features. Although previously logged, the site presently has a relatively mature mix of conifers and hardwoods. The property has approximately 1,500 feet of White Creek riparian habitat.

### 2.1.3 Effects of The Proposed Action

The FHWA/WSDOT determined that the proposed DFS is likely to adversely affect PS chinook. NOAA Fisheries' ESA implementing regulations define "effects of the action" as "the direct and indirect effects of an action on the species or critical habitat together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline." "Indirect effects" are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02).

### *2.1.3.1 Direct Effects*

Direct effects are the immediate effects of the project on the species or its habitat. Direct effects result from the agency action and include the effects of interrelated actions and interdependent actions. Future Federal actions that are not a direct effect of the action under consideration (and not included in the environmental baseline or treated as indirect effects) are not evaluated.

As stated earlier, it is likely that no adverse effects occurred from construction activities associated with the installation of the DFS. In coordination with NOAA Fisheries and the WDFW, and the United States Fish and Wildlife Service, WSDOT implemented appropriate on site construction techniques and best management practices, which were fully implemented and largely minimized and avoided vegetation removal and sediment delivery to the Skagit River. In addition, nearly 200 cubic yards of riprap was removed and replaced with native trees and shrubs. Other riprap was covered with organic matter and inter-planted to ensure soil retention.

The purchase of the Smith Property and the conservation easement secured on the White Creek property will have no direct effects upon listed species or habitat. Active restoration methods such as planting native vegetation are not proposed by WSDOT.

### *2.1.3.2 Indirect Effects*

Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur and may occur outside of the area directly affected by the action. Indirect effects may include other Federal actions that have not undergone section 7 consultation but will result from the action under consideration. These actions must be reasonably certain to occur, or be a logical extension of the proposed action.

Longer term effects of the proposed project have been assessed based on WSDOT's BA and associated documents provided to NOAA Fisheries. Within the context of elevated baseline sediment delivery rates throughout the Skagit River Basin, the installation of the DFS will result in temporal degradation of PS chinook spawning and rearing habitat within the mainstem Skagit River because it will enable increased delivery of fine sediments to chinook spawning and rearing habitats that are already degraded from increased sediment delivery. Similar to habitats within the rest of the Skagit River and the PS chinook ESU, landslides are part of the natural disturbance regime within the project and action area (Naiman *et al.* 1992). However, as stated in sections 2.1.2.3 and 2.1.2.5, anthropogenic influences have altered the rate and timing of these events in some watersheds in the Skagit River Basin, including the 20 acre subbasin above the DFS. The additive effect of past logging practices and land clearing has altered the frequency, magnitude, and spatial distribution of landslides in the project and action area and within many of the fifth field subbasins of the Skagit River Basin (Williams *et al.* 1975; Beamer *et al.* 1999). The distant and recent history of slides within the project and action area, and the fact that the DFS was designed to mitigate the effects of slides on SR 20 provides strong evidence that future slides can and will occur. Before the DFS, landslides were largely arrested on SR 20, which prevented most slide material from entering the Skagit River. After slides, materials would be

hailed off the road and damage repaired.

Adverse effects to chinook and their habitat are reasonably certain to occur because the DFS will pass these materials under SR 20 and into the Skagit River. These adverse effects are exacerbated by the increased frequency and altered composition of slides relative to areas that have not been logged and/or developed. Periodic deposition of slide materials have both adverse and beneficial effects on salmonids. Debris from landslides from the project site would consist of cobble, gravel, wood, and sediment, all of varying sizes. As a result, baseline levels of fine sediment within chinook spawning grounds are elevated compared to pre-disturbance levels. Landslides from the 20 acre subbasin above the DFS will likely occur more frequently than an undisturbed system and deliver greater proportions of materials that are injurious to PS chinook, namely fine sediments, than beneficial materials such as wood.

### *Sediment*

While the addition of cobble, gravel, and large wood would not likely result in significant adverse affects, the introduction of fine sediment to the river could potentially embed spawning substrate, and decrease the water flow to and emergence rates within redds. Further, a decrease in macroinvertebrate prey populations may occur from sediment compromising the surface area of benthic habitat, and rearing juvenile PS chinook may be forced to alter habitat utilization.

The egg/alevin stage of the Lower Skagit stock will be most acutely effected from slides. This stock typically constructs 3 to 15 redds as close as 1,700 feet (one third of a mile) downstream of the DFS. These redds, and the typical 45 constructed between RM 54 and 52 are most vulnerable to mortality. Most slide events will occur during the period of PS chinook incubation within redds near the project area (roughly October through March). As such, slides passing under the DFS could embed and kill eggs and pre-emerged alevins if they occur during periods of redd incubation. A study within several Puget Sound rivers using artificial redds demonstrated significantly greater quantities of intruded fine sediments within 'redds' located below slides verse those placed above (DeVries *et al*, 2001). The degree of in-redd mortality is dependant upon a host of factors, including: 1) the size of the slide; 2) the discharge of the Skagit River when they occur; 3) the composition and size of sediments in the slide; 4) the location of the redd within the river channel, including distance downstream of the DFS; 5) how recently the redd was constructed, and; 6) the baseline level of sediments within redd substrate prior to each slide event.

Several studies have suggested that survival to emergence is more related to substrate composition than peak flow magnitude and hydraulic conditions above the redd (Scrivener and Brownlee 1989; Beschta and Jackson 1979). Oxygen delivery to redds is dependant upon substrate permeability and intragravel flow, both of which are dependant upon the amount of fine sediment in the streambed (Cordone and Kelly 1961; Silver *et al*, 1963). Fine sediment can act as a physical barrier to fry emergence (Cooper 1959, 1965; Wickett 1958; McNeil and Ahnell 1964), and McHenry *et al*. (1994) found that fines (greater than 13% of sediments less than 0.85mm) resulted in intragravel mortality of salmonid embryos due to oxygen stress and

metabolic waste build-up. Though lacking strong evidence, there are indications that relative mortality from fine sediment intrusion decreases from the time the redd was constructed (Groot and Margolis 1991). As eggs mature and alevin eventually develop to fry, more individuals may be able to withstand fine sediment intrusions.

Slides occurring outside of redd incubation periods could nonetheless result in sublethal effects through degraded habitat conditions for juvenile PS chinook throughout the action area. Fine sediment can affect juvenile salmonid prey by embedding gravels and cobble reducing accessibility to microhabitats by, entombing and suffocating benthic organisms (Brusven and Prather 1974). When fine sediment is deposited on gravel and cobble, benthic species diversity and densities drop significantly (Cordone and Pennoyer 1960; Herbert *et al.* 1961; Bullard 1965; Reed and Elliot 1972; Nuttall and Bilby 1973; Bjorn *et al.* 1974; Cederholm *et al.* 1978). Reduced prey availability could contribute to reduced growth and survival of juvenile PS chinook.

Sediment deposition can lead to decreased levels of dissolved oxygen (DO). In addition to the potential lethal effects of low DO, sublethal effects can occur. Bjorn and Reiser (1991) determined that growth and food conversion efficiency are affected at DO levels of less than 5mg/L. Phillips and Campbell (1961) determined that DO levels must average greater than 8mg/L for embryos and alevins to have good survival rates. Silver *et al.* (1963) and Shumway *et al.* (1964) observed that salmonids reared in water with low or intermediate oxygen levels were smaller sized and had a longer incubation period than those raised at high DO levels. Low DO levels increased the incubation periods for anadromous species, and decreased the size of alevins (Garside 1966; Doudoroff and Warren 1965; Alderice *et al.* 1958).

Fish that remain in turbid (or elevated TSS) waters might be less susceptible to predation by piscivorous fish and birds (Gregory and Levings 1998). In systems with intense predation pressure, this provides a beneficial trade-off (enhanced survival) to the cost of potential physical effects (reduced growth). Turbidity levels of about 23 Nephelometric Turbidity Units have been found to minimize bird and fish predation risks (Gregory 1993). Exposure duration is a critical determinant of the occurrence and magnitude of physical or behavioral effects. Salmonids have evolved in systems that periodically experience short-term pulses (days to weeks) of high suspended sediment loads, often associated with flood events, and are adapted to such high pulse exposures. Adult and larger juvenile salmonids appear to be little affected by the high concentrations of suspended sediments that occur during storm and snowmelt runoff episodes (Bjorn and Reiser 1991). However, research indicates that chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Redding *et al.* 1987; Lloyd 1987; Servizi and Martens 1991).

### *Large Wood, Cobble and Gravel*

The addition of wood, cobble and gravel from a landslide at RM 57 would likely enhance certain habitat functions essential to PS chinook stocks of the Skagit River. Though some wood may be caught on the DFS infrastructure or SR 20, most is anticipated to enter the river during slide

events. Large wood can disperse flow energy, which may create sections of stable gravels better protected from scouring related to high flows (Naiman *et al.* 1992). Large wood also increases coarse sediment retention (including allochthonous inputs), provides long-term nutrient storage and substrate for aquatic invertebrates, and provides refugia habitat for juvenile salmonids during high flow events (Bisson *et al.* 1987). Sediment and organic storage occurs at a greater rate in the presence of large debris-dams, such as those historically present in the Skagit River, reducing the rate of transport down-river. Debris-dams also protect downstream reaches from large-scale changes in sediment loading (Spence *et al.* 1996). Sedell and Luchessa (1982) documented that in high order streams including systems in the Puget Lowlands, debris-dams historically increased channel complexity by creating side channels, backwaters and pools, and once played a major role in floodplain and meander development.

The addition of cobble and gravels would likely benefit habitat conditions for the Lower Skagit chinook stock in particular. A future landslide at RM 57 would partially replenish spawning grounds that may be compromised by lack of allochthonous recruitment due to the location of SR 20 and high sediment loads resulting from altered watershed and riparian function upriver of the project site.

#### *Smith and White Creek Property Conservation*

The acquisition of the Smith and White Creek property will enable natural habitat functions associated with these parcels to continue be enhanced over time. The preservation of the Smith property site contributes to habitat conditions necessary for adjacent PS chinook spawning and rearing habitat. The continued natural rehabilitation and succession of the Smith Parcel will benefit future large wood and organic material recruitment into the Skagit River, as well as providing enhanced juvenile rearing near the riparian habitats of the parcel during a variety of flow events. Fine sediment eroded from various flow events will likely decrease as vegetation is allowed to mature and develop within the property and its riparian habitats. In turn, fine sediment levels downstream will not be exacerbated from chronic sedimentation from the site. The White Creek property conservation easement will also facilitate continued natural habitat succession. This property will continue to provide the necessary habitat functions associated with riparian habitats, including shade, and wood recruitment to the Skagit River Basin. Further, the preservation of this site is critical because it is located directly above PS chinook spawning sites in the Sauk River.

These purchase and conservation easement actions ensure that land use conversion will not occur on these sites, which could result in elevated sediment levels within White Creek, the Sauk River and the Skagit River, in turn impacting PS chinook redds and rearing habitat. Habitat preservation actions such as these are critical to protect key production areas for aquatic species (Roni *et al.* 2002).

### *2.1.3.3 Summary of Indirect Effects*

The anticipated landslide event(s), at RM 57 will likely result in the complete loss and/or decreased emergence rates from some main-stem PS chinook redds located down-river of the project site. Particularly vulnerable are the 3-15 redds typically constructed approximately 1,700 feet (one third of a mile) downstream of the confluence of the Baker River near RM 56. Sediment loading to the Skagit River may also adversely affect rearing juvenile PS chinook and some of their prey sources down-river of the project site. These adverse effects will be partly balanced by the addition of large wood, cobble and gravels, which would likely enhance habitat conditions for Skagit River PS chinook. The facilitation of improved riparian function at RM 57 would likely enhance the baseline conditions of the project and action area.

Property conservation at the Smith and White Creek sites will ensure that future habitat degradation will not occur from land conversion. Importantly, natural habitat succession will continue, which will likely provide enhanced functions to listed PS chinook through increased shade, sediment retention, and large wood recruitment, among other functions. Each site is adjacent to PS chinook spawning locations, as such, preservation of these areas is an incremental, yet critical measure to ensure the future biological integrity of habitats within the basin.

### 2.1.4 Cumulative Effects

Cumulative effects are defined as “those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation” (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

NOAA Fisheries believes the majority of environmental effects related to future growth will be linked to land clearing, associated use shift (i.e. from forest to lawn/pasture) and impervious surface and related changes. Land use development within the action area is occurring at a rapid rate. Population growth and attendant land use change in the Skagit Watershed will continue in the foreseeable future (Washington State Department of Natural Resources 1998). The population of Mount Vernon is expected to almost double by 2015 (Swisher 1999). Land use changes and development of the built environment are likely to continue under existing zoning. All of these factors have contributed to the present status of PS chinook and will continue to bear on the survival and recovery of the species. Existing state and local regulatory mechanisms intended to address the effects of these activities on the environment are important but generally do not specifically or sufficiently address the function of processes that create salmonid habitat. While existing regulations probably decrease the rate of adverse effect of land use activities on watershed function, they probably continue to allow incremental degradation, which when added to the environmental baseline lead to consistently depressed habitat function, quantity, and quality for listed species. Cumulative effects within the action area will be subject to continuing change that must be added to the baseline in arriving at a determination regarding species

jeopardy.

#### 2.1.5 Conclusion

The NOAA Fisheries has determined, based on the information, analysis, and assumptions described in this Opinion, that the proposed action is not likely to jeopardize the continued existence of PS chinook. In arriving at this determination, NOAA Fisheries considered the status of the PS chinook ESU, environmental baseline conditions, the direct and indirect effects of the action, and the cumulative effects of actions anticipated in the action area.

The proposed action, when added to the environmental baseline, would probably enable occasional, relatively short-term effects on PS chinook habitat in the form of material deposited from local landslides directly into the Skagit River through the DFS. There were no effects from constructing the DFS. To address environmental changes in the action area from the DFS, the action includes acquisition and preservation of functioning habitat in the action area that might otherwise be available for development. Acquisition prevents permanent loss of function and will enable attainment and maintenance of properly functioning conditions offsetting the effects of future landslides that might deposit material to the Skagit River through the DFS. Therefore, the extent of effects on PS chinook attributable to the proposed action are unlikely to adversely influence the numbers, distribution, or reproduction of PS chinook in the action area. In fact, the adverse effects of landslide deposition would be minimized, if not offset, or even improved in the long-term through the simultaneous introduction of spawning gravels and large wood from landslides (the beneficial effect of this natural process that had been previously interrupted by the existence of SR 20), as well as the long-term habitat conservation achieved through the Smith purchase and the White Creek conservation easement. As such, the proposed activities are not expected to appreciably reduce the likelihood of survival and recovery of PS chinook.

#### 2.1.6 Conservation Recommendations

Section 7 (a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of threatened and endangered species. Conservation recommendations are discretionary measures suggested to minimize or avoid adverse effects of a proposed action on listed species, to minimize or avoid adverse modification of habitats, or to develop additional information. NOAA Fisheries believes the following conservation recommendations are consistent with these obligations, and therefore should be carried out by FHWA. This information will help to reduce uncertainty about the effects of past and ongoing human and natural factors leading to the status of listed salmon and steelhead, their habitats, and the aquatic ecosystem within the action area.

- 1) The FHWA should re-plant the DFS subsequent to slides that denude the riparian habitat adjacent to the Skagit River. This measure would minimize chronic delivery of sediments.

#### 2.1.7 Reinitiation of Consultation

Consultation must be reinitiated if the amount or extent of taking specified in the Incidental Take Statement is exceeded, or is expected to be exceeded; new information reveals effects of the action may affect listed species in a way not previously considered; the action is modified in a way that causes an effect on listed species that was not previously considered; or a new species is listed or critical habitat is designated that may be affected by the action (50 CFR 402.16). To reinitiate consultation, the FHWA should contact the Habitat Conservation Division (Washington State Habitat Branch) of NOAA Fisheries.

## **2.2 Incidental Take Statement**

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species without special exemption. “Take” is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Harm is further defined as significant habitat modification or degradation that actually kills or injures listed species by “significantly impairing essential behavioral patterns such as breeding, spawning, rearing, migrating, feeding, and sheltering” (50 CFR 222.102). Incidental take is take of listed animal species that results from, but is not the purpose of, the Federal agency or the applicant carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered prohibited taking provided that such takings is in compliance with the terms and conditions of this incidental take statement.

An incidental take statement specifies the effects of any incidental take of endangered or threatened species that is reasonably certain to occur as a result of the proposed action. It also provides reasonable and prudent measures that are necessary to minimize take and sets forth terms and conditions with which the action agency must comply to implement the reasonable and prudent measures.

### **2.2.1 Amount or Extent of Take Anticipated**

As stated in section 2.1.1 above, PS chinook use the action area for a variety of life stages and are likely to be present in the action area when project effects are manifested. Because of the likelihood of exposure of PS chinook to the above described effects, take is reasonably certain to occur. The proposed action is reasonably certain to result in incidental take through harm in the form of habitat modification that impairs the normal life-history patterns of PS chinook, particularly pre-emerged alevin and fry.

The exact numerical amount of expected take is difficult if not impossible to determine as take is anticipated to follow typically periodic, but largely unpredictable landslides. Therefore the amount of anticipated take has not been quantified. Deposition of landslide materials is likely to kill or injure PS chinook when large volumes of fine sediment are introduced into the Skagit River within the action area. Specifically, sediment deposited onto PS chinook redds are likely to kill some eggs and pre-emerged alevin or fry by suffocation. The extent of effects to redds from sediment deposition could include virtually all of the redds of the Lower Skagit stock from

the DFS downstream to RM 20. The most likely risk of mortality to some pre-emerged alevin or fry within the typical 3 to 15 redds near RM 56, and the typical 45 redds from RM 54 to RM 52. These estimates reflect the greatest probable spatial extent of embeddedness which could result in mortality to PS chinook. Transitory sublethal effects to juvenile chinook, as described in section 2.1.3.2, could occur as fine sediments are carried throughout the river basin until convergence with saline waters.

### 2.2.2 Reasonable and Prudent Measures

The measures described below are non-discretionary. They must be implemented so that they become binding conditions in order for the exemption in section 7(a)(2) to apply. The FHWA has the continuing duty to regulate the activities covered in this incidental take statement. If the FHWA fails to retain the oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse. NOAA Fisheries believes that activities carried out in a manner consistent with these reasonable and prudent measures, will not necessitate further site-specific consultation. Activities which do not comply with all relevant reasonable and prudent measures will require individual consultation.

NOAA Fisheries believes that the following reasonable and prudent measures are necessary and appropriate to avoid or minimize the amount or extent of take of listed fish resulting from implementation of this Opinion.

The FHWA shall:

1. Minimize incidental take by ensuring that wood is allowed to be delivered to the Skagit River under the DFS.
2. Minimize incidental take by ensuring that the Smith and White Creek Properties are allowed to continue natural habitat succession.

### 2.2.3 Terms and Conditions

To comply with ESA section 7 and be exempt from the prohibitions of ESA section 9, the FHWA must comply with the terms and conditions that implement the reasonable and prudent measures. These terms and conditions are non-discretionary.

1. To implement RPM No. 1 above, the FHWA will ensure that woody debris that are caught on or under the DFS or SR 20, are not removed from the system, but are rather released into the river on site.
2. To implement RPM No. 2 above, the FHWA shall adhere to the conservation/purchase agreements as detailed in the administrative record within the file 2003-00231 at the NOAA Fisheries Lacey, Washington office associated with this project.

### 3.0 MAGNUSON-STEVENSON FISHERY CONSERVATION AND MANAGEMENT ACT

#### 3.1 Background

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- a. Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (section 305(b)(2)).
- b. NOAA Fisheries must provide conservation recommendations for any Federal or state action that would adversely affect EFH (section 305(b)(4)(A)).
- c. Federal agencies must provide a detailed response in writing to NOAA Fisheries within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NOAA Fisheries EFH conservation recommendations, the Federal agency must explain its reasons for not following the recommendations (section 305(b)(4)(B)).

Essential Fish Habitat means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA section 3). For the purpose of interpreting this definition of EFH: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.10). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (*i.e.* contamination or physical disruption), indirect (*i.e.* loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

Essential Fish Habitat consultation with NOAA Fisheries is required regarding any Federal agency action that may adversely affect EFH, including actions that occur outside EFH, such as certain upstream and upslope activities.

The objectives of this EFH consultation are to determine whether the proposed action would adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH.

### **3.2 Identification of Essential Fish Habitat**

Pursuant to the MSA the Pacific Fisheries Management Council (PFMC) has designated EFH for three species of federally-managed Pacific salmon: chinook (*Oncorhynchus tshawytscha*); coho (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*)(PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC 1999), and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of potential adverse effects to these species' EFH from the proposed action is based, in part, on this information.

### **3.3 Proposed Actions**

The proposed action and action area are detailed above in section 1.2 and 2.1.2.3, of this document. The action area includes habitats that have been designated as EFH for various life-history stages of Pacific salmon.

### **3.4 Effects of Proposed Action**

As described in detail in section 2.1.3.1 of this document, the proposed actions may result in short-term adverse effects to a variety of habitat parameters. These adverse effects are:

1. Increases in turbidity as a result of landslides under the DFS.
2. Removal of wood caught on the DFS.

### **3.5 Conclusion**

NOAA Fisheries concludes that the proposed action would adversely affect the EFH for chinook; coho (*O. kisutch*), and Puget Sound pink salmon (*O. gorbuscha*).

### **3.6 Essential Fish Habitat Conservation Recommendations**

Pursuant to section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations to Federal agencies regarding actions which may adversely affect EFH.

1. Conservation recommendations for increases of turbidity from operation of the DFS:
  - a) The FHWA should re-plant the DFS subsequent to slides that denude the riparian habitat adjacent to the Skagit River. This measure would minimize chronic delivery of

sediments.

2. Conservation recommendations for removal of wood caught on the DFS:
  - a) The FHWA should ensure that woody debris that are caught on or under the DFS or SR 20, are not removed from the system, but are rather released into the river on site.

### **3.7 Statutory Response Requirement**

Pursuant to the MSA (§305(b)(4)(B)) and 50 CFR 600.920(k), Federal agencies are required to provide a detailed written response to NOAA Fisheries' EFH conservation recommendations within 30 days of receipt of these recommendations. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. In the case of a response that is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

### **3.8 Supplemental Consultation**

The FHWA must reinitiate EFH consultation with NOAA Fisheries if the proposed actions are substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR 600.920(l)).

#### 4.0 REFERENCES

Section 7(a)(2) of the ESA requires Opinions to be based on "the best scientific and commercial data available." This section identifies the data used in developing this opinion.

- Alderice, D. F., W. P. Wickett, and J. R. Brett. 1958. Some effects of temporary exposure to low dissolved oxygen levels on Pacific salmon eggs. *Journal Fisheries Research Board of Canada* 15:229-250.
- Beamer, E., T. Beechie, B. Perkowski, and J. Klochak. 1999. River Basin Analysis of the Skagit and Samish Basins: Tools for Salmon Habitat Restoration and Protection. Skagit Watershed Council. <http://www.skagitwatershed.org>.
- Beschta, R. L. And W. L. Jackson. 1979. The intrusion of fine sediments into a stable gravel bed. *J. Fish. Res. Bd. Can.* 36:204-210.
- Bisson, P. A., R. E. Bilby, M. D. Bryant, C. A. Dollaff, G. B. Grette, R. A. House M. L. Murphy, K. V. Koski, and J. R. Sedell. 1987. Large woody debris in forested streams in the Pacific Northwest: past, present, and future. Pages 143-193 *in* E. O. Salo and T. W. Cundy, editors. *Streamside management: forestry and fishery interactions*.
- Bjorn, T. C., M. A. Brusven, M. Molnau, F. J. Watts, R. L. Wallace, D. R. Neilson, M.F. Sandine, and L.C. Stuehrenberg. 1974. Sediment in streams and its effects on aquatic life. Technical Completion Report, Project B-025-IDA. University of Idaho, Water Resource Research Institute, Moscow.
- Bjorn, T. C. and D. W. Reiser. 1991. Habitat requirements of salmonids in streams. Pages 83-138 *In* R. J. Naiman, ed. *Influences of forest and rangeland management on salmonid fishes and their habitats*. Special Publ. 19. Amer. Fish. Soc., Bethesda, Maryland.
- Bledsoe, L. J., D. A. Somerton, C. M. Lynde. 1989. Proceedings of the National Workshop on Effects of Habitat Alteration on Salmonid Stocks., 1989, Pp. 50-61, Can. Spec. Publ. Fish. Aquat. Sci., No. 105.
- Brusven, M. A., and K. V. Prather. 1974. Influence of stream sediments on distribution of macrobenthos. *Journal of the Entological Society of British Columbia* 71:25-32.
- Bullard, W. E., Jr. 1965. Role of watershed management in the maintenance of suitable environments for aquatic life. Pages 265-269 *in* C. M. Tarzwell, editor. *Biological problems in water pollution: transactions of the third seminar*. U.S. Department of Health, Education, and Welfare, Public Health Service, Cincinnati Ohio.
- Cooper, A.C. 1959. Discussion of the effects of silt on survival of salmon eggs and larvae. Pages 18-22 *in* proceedings of the fifth symposium-Pacific Northwest on siltation-its

- source and effects on aquatic environment. U.S. Department of Health, Education and Welfare, Portland, Oregon.
- Cooper, A.C. 1965. The effects of transported stream sediments on the survival of sockeye and pink salmon eggs and alevins. Bulletin 18. International Pacific Salmon Fisheries Commission, New Westminster, British Columbia, Canada.
- Cordone, A. J., and D.W. Kelley. 1961. The influences of inorganic sediment on the aquatic life of streams. California Fish and Game 47:189-228.
- Cordone, A. J., and S. Pennoyer. 1960. Notes on silt pollution in the Truckee River Drainage. Inland Fisheries Administrative Report 60-14. State of California, California Fish and Game, Sacramento.
- Cederholm, C. J., L. C. Lestelle, B. G. Edle, D. J. Martin, J. V. Tagart, and E.O. Salo. 1978. The effects of landslide siltation on the salmon and trout resources of Stequaleho Creek and the main Clearwater River, Jefferson County, Washington, 1972-1975. Final Report FRI-UW-7804. University of Washington, Fisheries Research Institute, Seattle.
- Devries, P., M. McHugh, E. Beamer, G. Pess and J. Glasgow. 2001. Monitoring and assessing fine sediment intrusion as a function of scour depth and sediment loading. R2 Resources Consultants, prepared for Washington Trout and the Washington State Department of Ecology. Available at the NOAA Fisheries Lacey, Washington Office, within the administrative record for document number 2003-00231.
- Doudoroff, P., and C. E. Warren. 1965. Environmental requirements of fishes and wildlife: dissolved oxygen requirements of fishes. Special Report 141. Oregon State University, Agricultural Experiment Station, Corvallis Oregon.
- Garside, E. T. 1966. Effects of oxygen in relation to temperature on the development of embryos of brook and rainbow trout. Journal Fisheries Research Board of Canada 23:1121-1134.
- Gregory, R. S. 1993. Effect of turbidity on the predator avoidance behavior of juvenile chinook salmon (*Oncorhynchus tshawytscha*). Canadian J. Fish. Aquatic Sciences 50:241-246.
- Gregory, R. S., and C. D. Levings. 1998. Turbidity Reduces Predation on Migrating Juvenile Pacific Salmon. Transactions of the American Fisheries Society 127: 275-285.
- Groot, C. and L. Margolis. 1991. Pacific Salmon Life Histories. University of British Columbia, UBC Press.
- Herbert, D. W. M., J. S. Alabaster, M. C. Dart, and R. Lloyd. 1961. The effect of china-clay

- wastes on trout streams. *International Journal of Air and Water Pollution* 5:56-74.
- Kosky, K. V. 1972. Effect of sediment on fish resources. Paper presented at Washington State Department of Natural Resources management Seminar, Lake Limerick, Washington.
- Lloyd, D. S. 1987. Turbidity as a water quality standard for salmonid habitats in Alaska. *North American Journal of Fisheries Management* 7:34-45.
- May, C. W., R. R. Horner, J. R. Karr, B. W. Mar and E. B. Welch. 1997. Effects of urbanization on small streams in the Puget Sound lowland ecoregion. *Watershed Protection Techniques* 2: 483-494.
- McHenry, M. L., D. C. Morrill, and E. Currence. 1994. Spawning gravel quality, watershed characteristics and early life history of coho salmon and steelhead in five North Olympic Peninsula watersheds. Prepared by the Lower Elwas S'Kallan tribe and the Makah Tribe, Port Angeles WA.
- McNeil, W. J., and W. H. Ahnell. 1964. Success of pink salmon spawning relative to size of spawning bed materials. *Special Scientific Report-Fisheries* 469. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C.
- Myers, J. M., R. G. Kope, G. J. Bryant, D. Teel, L. J. Lierheimer, T. C. Wainwright, W. S. Grand, F. W. Waknitz, K. Neely, S. T. Lindley, and R. S. Waples. 1998. Status review of chinook salmon from Washington, Idaho, Oregon, and California. U.S. Department of Commerce, NOAA Technical Memo. NMFS-NWFSC
- Naiman, R. J. editor. 1992. *Watershed management: balancing sustainability and environmental change*. Springer-Verlag Inc., New York.
- NMFS (National Marine Fisheries Service) 1996. *Factors for Decline: A Supplement to the Notice of Determination for West Coast Steelhead*. Habitat Conservation Program, Portland, Oregon.
- NMFS (National Marine Fisheries Service) 1998. *Factors Contributing to the Decline of West Coast Chinook Salmon: An Addendum to the 1996 West Coast Steelhead Factors for Decline Report*. Habitat Conservation Program, Portland, Oregon.
- NOAA Fisheries (National Marine Fisheries Service). 2003. Preliminary conclusions regarding the updated status of ESUs of West Coast salmon and steelhead (draft). <http://www.nwr.noaa.gov/BRTdraftreport/BRTdraftreport.html>
- Nuttall, P. M., and G. H. Bilby. 1973. The effect of china-clay wastes on stream invertebrates. *Environmental Pollution* 5:77-86

- PFMC. (Pacific Fishery Management Council). 1999. Amendment 14 to the Pacific Coast Salmon Plan. Appendix A: Description and Identification of EFH, Adverse Impacts and Recommended Conservation Measures for Salmon. Portland, Oregon.
- Phillips, R.W., and H. J. Campbell. 1961. The embryonic survival of coho salmon and steelhead trout as influenced by some environmental conditions on gravel beds. 14<sup>th</sup> annual report of the Pacific Marine Fisheries Commission, Portland Oregon.
- Puget Sound Technical Review Team (TRT). 2001. Independent populations of chinook salmon in Puget Sound. Puget Sound TRT Public review draft 11 April, 2001.
- Redding, J. M., C. B. Schreck, and F. H. Everest. 1987. Physiological effects on coho salmon and steelhead of exposure to suspended solids. Transactions of the American Fisheries Society 116: 737-744.
- Rand, G. M., and S. R. Petrocelli, editors. 1985. Fundamentals of aquatic toxicology: methods and applications. Hemisphere Publishing Corporation, Washington, D.C.
- Reed, R. D., and S. T. Elliot. 1972. Effects of logging on Dolly Varden. Project F-9-4, Job R-IV-B. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Division of Sport Fisheries, Juneau, Alaska
- Romanski, T. 1997. Skagit River Flood Damage Reduction Reconnaissance Study Planning Aid Report. United States Fish and Wildlife, North Pacific Coast Ecoregion, Lacey, WA.
- Roni, P., Beechie, T. J., Bilby, R. E., Leonetti, F. R., Pollock, M. M. and G. R. Pess. A review of Stream Restoration Techniques and a Hierarchical Strategy for Prioritization Restoration. 2002.
- Scrivener, J. C. And M. J. Brownlee. 1989. Effects of forest harvesting on spawning gravel and incubation survival of chum (*Oncorhynchus keta*) and coho (*Oncorhynchus kisutch*) in Carnation Creek, British Columbia. Can. J. Fish. Sci. 46: 681-696.
- Sedell, J. R., and K. J. Luchessa. 1982. Using the historical record as an aid to salmonid habitat enhancement. Pages 210-223 in N. B. Armantrout, editor. Acquisition and Utilization of Aquatic habitat Inventory Information, symposium held 23-28 October 1981, Portland, Oregon. American Fisheries Society, Western Division, Bethesda, Maryland.
- Servizi, J. A., and Martens, D. W. 1991. Effects of temperature, season, and fish size on acute lethality of suspended sediments to coho salmon. Canadian Journal of Fisheries and Aquatic Sciences 49:1389-1395.
- Shumway, D. L., C. E. Warren, and P. Doudoroff. 1964. Influence of oxygen concentration and water movement on the growth of steelhead trout and coho salmon embryos.

- Transactions of the American Fisheries Society 92: 342-356.
- Silver, S. J., C. E. Warren, and P. Doudoroff. 1963. Dissolved oxygen requirements of developing steelhead trout and chinook salmon embryos at different water velocities. Transactions of the American Fisheries Society 92: 327-343.
- Spence, B. C. , G. A. Lomnický, R. M. Hughes, and R. P. Novitzki, 1996. An Ecosystem approach to salmonid conservation. TR-4501-96-6057. ManTech Environmental Research Services Corp., Corvallis, OR.
- Swisher, K. 1999. Biological Assessment Report, Riverside Bridge Replacement Project, Cities of Burlington and Mount Vernon, Washington. Prepared for City of Mount Vernon, City of Burlington
- Terich, T. A., 1987, Living with the Shore of Puget Sound and the Georgia Strait, Durham.
- Washington Department of Fisheries (WDF), Washington Department of Wildlife (WDW), and Western Washington Treaty Tribes (WWTIT), 1993. 1992 Washington State salmon and steelhead inventory (SASSI).
- Washington State Department of Transportation (WSDOT), 2000. Biological Assessment, SR 20, Mile Post 90.1 Vicinity, Debris Flow Structure.
- Washington State Department of Natural Resources, 1998. Our Changing Nature, Natural Resource Trends in Washington State.
- Wickett, W. P, 1958. Review of certain environmental factors affecting the production of pink and chum salmon. Journal Fisheries Research Board of Canada 15:1103-1126.
- Williams, R. W., R. M. Larimie, and J. J. Ames, 1975. A catalog of Washington streams and salmon utilization. Volume 1. Puget Sound Region. WDFW.